4 Alignment and Adjustments

This section of the service manual explains how to make permanet adjustments to the monitor.
Use the MTI-2031 jig and soft jig when adjust this part.

4-1 Adjustment Conditions

Caution: Changes made without the Softjig are saved only to the user mode settings. As such, the settings are not permanently stored and may be inadvertently deleted by the user.

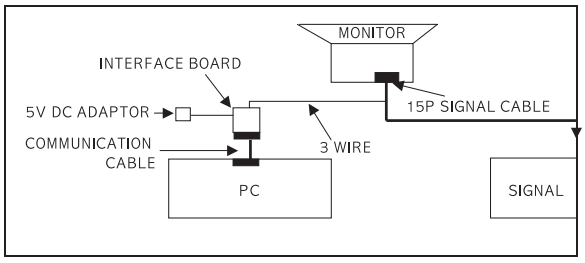

Figure 4-1. When using signal generator

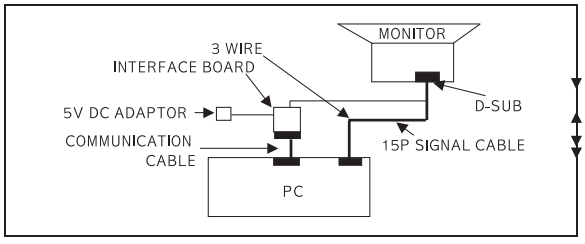

Figure 4-2. When using only PC

4-1-1 Before Making Adjustments

4-1-1 (a) ORIENTATION

When servicing, always face the monitor to the east.

4-1-1 (b) WARM-UP TIME

The monitor must be on for 30 minutes before starting alignment. Warm-up time is especially critical in color temperature and white balance adjustments.

4-1-1 (c) SIGNAL

Analog, 0.7 Vp-p positive at 75 ohm, internal termination

Sync: Separate/Composite
(TTL level negative/positive)

Table 4-1. MDL File and DDC File on each model

Model	MDL File	DDC File	Remarks
LE19IS	LE19I_SDI_BNC_v00	SM997DF.ddc	Syncmaster
LE19IS	LE19IS_SDI_v00	CD197G.ddc	Syncmaster
LE19IT	LE19IT_SDI_v00	S990DF.ddc	Syncmaster
		ST98PDF.ddc	Syncmaster
LE17IS	LE17IT_SDI_v00	SM797DF.ddc	Syncmaster
		SM737DF.ddc	Syncmaster

4-1-1 (d) SCANNING FREQUENCY

Horizontal: 30 kHz ~ 96 kHz (Automatic)
Vertical: 50 Hz ~ 160 Hz (Automatic)

4-1-1 (e) HIGH VOLTAGE ADJUSTMENT

Signal: 1024 x 768 mode (68 kHz / 85 Hz)
Display image: Full white
Contrast: Maximum
Brightness: Maximum
Limit: LE17 inch
Direct POINT : 26.0KV ± 0.5KV
Indirect POINT : 200V ± 1V

LE19 inch
Direct POINT : 27.0KV ± 0.5KV
Indirect POINT : 210V ± 1V

Measure high voltage with the indirect point (LOCATION: TP501). If you need, use the soft Jig.

4-1-1 (f) G2 (SCREEN) VOLTAGE

Adjust G2 voltage with screen VR of FBT up to the voltage of 570V (17 inch) 530V (19 inch)

4-2 Display Control Adjustments

4-2-1 Display Control Adjustments

4-2-1(a) HOW TO ADJUST THE SCREEN

Refer to the contents from 4-2-1 to 4-2-9.

1. Choose the MDL file of the relevant model on MDL file.
2. Delete the user.
3. Dump the stand mode from the soft jig geometry mode.
4. Save the all mode after adjusting the screen in the standard mode (68 kHz / 85 Hz).
5. Savethe mode after adjusting the screen in the other modes.

Notice : *Don't save the all mode after adjusting the other mode.*

4-2-2(b) TERMS OF THE SCREEN ADJUSTMENT

Scanning frequency:	68 kHz / 85 Hz
Screen:	Latticed pattern
Brightness:	The minimum (Cut-off)
Image:	The maximum

4-2-2 Centering

Centering means to position the center point of the display in the middle of the display area. Horizontal size and position and vertical size and position control the centering of the display.

Adjust the horizontal size and vertical size to their optimal settings: see table 4-3.
1024 x 768 mode (68 kHz / 85 Hz)

Adjust the horizontal position and vertical position to ≤ 4.0 mm of the center point of the screen.

| A-B | ≤ 4.0 mm. | | C-D | ≤ 4.0 mm.

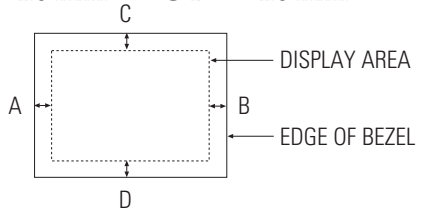

Figure 4-3. Centering

4-2-2 (a) HORIZONTAL SIZE ADJUSTMENT

Click on the << or >> box next to **SIZE B+** to adjust the horizontal size of the display pattern to 312 mm / 356 mm (Tolerance: ± 3 mm) as the "H_SIZE" is "60" on the OSD.

4-2-2 (b) VERTICAL SIZE ADJUSTMENT

Click on the << or >> box next to **V_SIZE** to adjust the vertical size of the display pattern to 234 mm / 264 mm. (Tolerance : ± 3 mm)

4-2-2 (c) HORIZONTAL POSITION ADJUSTMENT

Click on the << or >> box next to **H_POSI** to center the horizontal image on the raster.

4-2-2 (d) VERTICAL POSITION ADJUSTMENT

Click on the << or >> box next to **V_POSI** to center the vertical image on the raster.

4-2-3 Linearity

Linearity affects the symmetry of images as they appear on the screen. Unless each row or column of blocks in a crosshatch pattern is of equal size, or within the tolerances shown in Table 4-1, an image will appear distorted, elongated or squashed.

$$\text{Horizontal Linearity} = 2x\,\frac{\text{X max-X min}}{\text{X max+X min}} x100$$

$$\text{Vertical Linearity} = 2x\,\frac{\text{Y max-Y min}}{\text{Y max+Y min}}\ x100$$

Table 4-2.

	Adjacent Linearity	Entire Linearity
Preset mode	≤ 4%	≤ 8%
Pre-load mode (48 kHz~)	≤ 5%	≤ 10%
Pre-load mode (under 48 kHz)	≤ 5%	≤ 14%

❊ Preset Mode : 68 kHz / 85 Hz
Pre-load Mode : Refer to Timing Chart

4-2-3 (a) HORIZONTAL LINEARITY ADJUSTMENT

To adjust the Horizontal Linearity, refer to Table 4-1 for the tolerance range.

Click on the << or >> box next to **H_LIN** to optimize the image.

Table 4-3.
(Horizontal x Vertical Size Table)

	17"	19"
Horizontal	312	352
Vertical	234	264

4-2-3 (b) VERTICAL LINEARITY ADJUSTMENT

To adjust the Vertical Linearity, refer to Table 4-1 for the tolerance range.
Use control bar after selecting "V_LINEARITY BAL" in left menu to optimize the image.

4-2-4 Trapezoid Adjustment

Use control bar after selecting **"TRAPEZOID"** in left menu to make the image area rectangular.

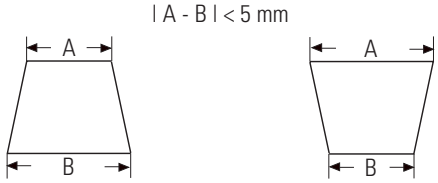

Figure 4-4. Trapezoid

4-2-5 Pinbalance Adjustment

Use control bar after selecting **"PINBALANCE"** in left menu to optimize the image.

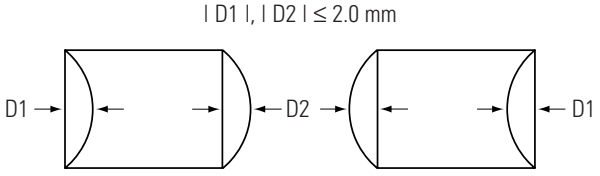

Figure 4-5. Pinbalance

4-2-6 Parallelogram Adjustment

Use control bar after selecting **"PARALLEL"** in left menu to make the image area rectangular.

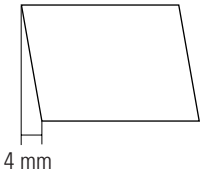

Figure 4-6. Parallelogram

4-2-7 Side Pincushion Adjustment

Use control bar after selecting **"PINCUSHION"** in left menu to straighten the sides of the image area.

| C1 |, | C2 | ≤ 2.0 mm, | D1 |, | D2 | ≤ 2.0 mm.

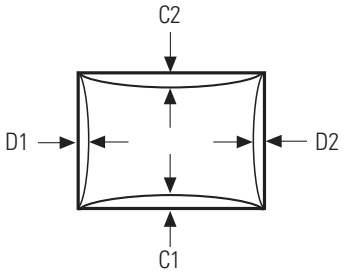

Figure 4-7. Pincushion

4-2-9 Degauss

No adjustments are available for the degaussing circuit. The degaussing circuit can effectively function only once per 30 minutes.

4-2-9 Save the Data

To save the adjustment data for factory frequencys, press **FACTORY SAVE**.

4-2-10 To Delete the User Mode Data

To delete the adjustment data from the user modes, click "@4: USER DELETE" in right menu.

4-3 Color Adjustments

4-3-1 Color Adjustments

4-3-1 (a) HOW TO ADJUST THE COLOR

Refer to the contents from 4-3-1 to 4-3-5.

1. Choose the MDL file of the relevant model on MDL file.
2. Delete the user.
3. Dump the stand color after choosing the color1 from the soft jig color mode.
4. Save the all color after adjusting the color1 .
5. Choose the color 2 and then adjust the color and then save.
6. Choose the color 3 and then adjust the color and then save.

Notice : *Don't save the all color after adjusting color 2 and 3.*

4-3-2 Color Coordinates (Temperature)

Color temperature is a measurement of the radiant energy transmitted by a color. For computer monitors, the color temperature refers to the radiant energy transmitted by white. Color coordinates are the X and Y coordinates on the chromaticity diagram of wavelengths for the visible spectrum.

CONDITIONS

Measurement instrument:	Color analyzer
Scanning frequency:	17 inch : 68 kHz / 85 Hz 19 inch : 91 kHz / 85 Hz
Display image:	White flat field at Center of display area
Brightness:	Cut-off
Contrast:	Maximum

PROCEDURE

Use the directions in sections 4-3-2 through 4-3-4 to adjust the color coordinates for:
9300K to x = 0.283 ± 0.015, y = 0.298 ± 0.015
5000K to x = 0.346 ± 0.02, y = 0.359 ± 0.02
sRGB to x = 0.312 ± 0.02, y = 0.329 ± 0.02

4-3-3 Color Adjustments for 9300K

4-3-3 (a) BACK RASTER COLOR ADJUSTMENT

CONDITIONS

Scanning frequency:	17 inch : 68 kHz / 85 Hz 19 inch : 91 kHz / 85 Hz
Screen:	Back raster pattern
Bright:	MAX
Contraster:	MAX

1. Select **COLOR CHANNEL 1** to control the color for 9300K.
2. Adjust the luminance of the back raster to between 0.5 to 0.7ft-L using the "**GREEN CUTOFF"** controls.
3. Use control bar after selecting **"BLUE CUTOFF"** in left menu to set the "y" coordinate to 0.298 ± 0.015
4. Use control bar after selecting **"RED CUTOFF"** in left menu to 0.283 ± 0.015

Notice : *If color values do not match desirable values, repeat sequence 3 and 4 after slightly readjusting "GREEN CUTOFF" control a little different.*

4-3-3 (b) GAIN (WITHOUT ABL) ADJUSTMENT

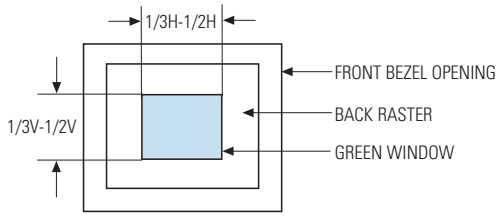

Figure 4-8. Green Box Pattern

CONDITIONS

Scanning frequency:	17 inch : 68 kHz / 85 Hz 19 inch : 91 kHz / 85 Hz
Screen:	White square
Bright:	Cut off
Contraster:	MAX

1. Bright should be cut off .
2. Save after adjusting like this (Color coordinates x=0.283 ± 0.02, y=0.298 ± 0.02 Brightness, 17 inch : 42 ± 1 F/L, 19 inch : 38 ± 1 F/L) with R,G,B gain key.
3. Adjust the high light brightness (17 and 19 inch : 65 ± 1 F/L) with BMCONT key after turning on BM and then save.

Notice : *Don't adjust BM of AN19MT. (There is no function for high light zone) Adjust BM only to color1.*

4-3-3 (c) MODIFY WITH ABL ADJUSTMENT

CONDITIONS

Scanning frequency:	17 inch : 68 kHz / 85 Hz 19 inch : 91 kHz / 85 Hz
Screen:	Full White Pattern
Bright:	Cut off
Contraster:	MAX

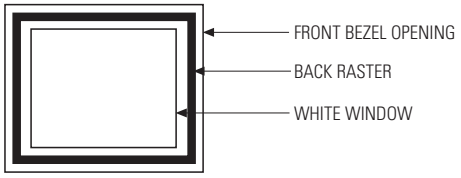

Figure 4-9. Full White Pattern

1. Bright should be cut off .
2. Save after adjusting the brightness (17, 19 inch : 30 F/L) with ABL key .
3. Save all colors.

Notice : *Save all color only to color1 . The value of color while adjusting ABL is hardly changed.*

Luminance Table (9300K) 4-4.

	17"	19"
With ABL	30 ft-L	30 ft-L
Without ABL	40 ft-L	38 ft-L
Without ABL (High Light is Activated)	65 ft-L	65 ft-L

4-3-3 (d) WHITE BALANCE ADJUSTMENT VERIFICATION

CONDITIONS

Scanning frequency:	17 inch : 68 kHz / 85 Hz 19 inch : 91 kHz / 85 Hz
Display image:	Back raster pattern
X-Y Coordinates:	x = 0.283 ± 0.02, y = 0.298 ± 0.02
Raster Luminance	0.3 ~ 1 ft-L
ABL Luminance	30 ± 1 ft-L
Brightness:	Cut-off
Contrast:	Maximum

1. Check whether the color coordinates of the back raster satisfy the above spec.

   If they do not, return to 4-3-2 (a) and readjust all settings.
2. Display a full white pattern.

Notice: *Do not touch the* ***G_GAIN*** *controls.*

3. Adjust the Contrast Control on the monitor so that the luminance of the video is about 5 ft-L.
4. Check whether the white coordinates of the video meet the above coordinates spec.
5. Adjust the Contrast Control again so that the luminance of the video is about 20 ft-L.
6. Check whether the white coordinates of the video satisfies the above spec.

   If they do not, return to 4-3-2 (a) and readjust all settings.

4-3-4 Color Adjustments for 5000K

4-3-4 (a) BACK RASTER COLOR ADJUSTMENT

CONDITIONS

Scanning frequency:	17 inch : 68 kHz / 85 Hz 19 inch : 91 kHz / 85 Hz
Display image:	Back raster pattern
Brightness:	MAX
Contrast:	MAX

1. Select **COLOR CHANNEL 2** to control the color for 5000K.
2. Adjust the luminance of the back raster to between 0.5 to 0.7 ft-L using the **G_CUT** controls.
3. Click on the << or >> boxes next to **R_CUT** and **B_CUT** to adjust the R-Bias to x = 0.346 ± 0.02 and the B-Bias to y = 0.359 ± 0.02

4-3-4 (b) GAIN (WITHOUT ABL) ADJUSTMENT

1. Bright should be cut off .
2. Save after adjusting like this (Color coordinates x=0.3460.03, y=0.3590.03 Brightness, 17 inch : 38 ± 1 F/L, 19 inch : 35 ± 1 F/L) with R,G,B gain key .

Notice : *The condition for adjusting is the same as 9300K. Modify to ABL adjustment.*

4-3-3 (c) WHITE BALANCE ADJUSTMENT

CONDITIONS

Scanning frequency: 17 inch : 68 kHz / 85 Hz
19 inch : 91 kHz / 85 Hz
Screen: Full White Pattern
Bright: Cut off
Contraster: MAX

1. Bright should be vut off .
2. Save after adjusting the brightness (17 inch : 30 ± 1 F/L, 19 inch : 28 ± 1 F/L) with ABL key.

Notice : *Don't save all colors after adjusting color save all color only to color1.*
The value of color coordinates while adjusting ABL is hardly changed.

4-3-4 (d) WHITE BALANCE ADJUSTMENT VERIFICATION

Refer to the procedure for 9300K, section 4-3-3 (d).

Luminance Table (5000K) 4-5.

4-3-5 Color	17"	19"
Without ABL	38 ft-L	35 ft-L
With ABL	30 ft-L	28 ft-L

Adjustments for sRGB

4-3-5 (a) BACK RASTER COLOR ADJUSTMENT

CONDITIONS

Scanning frequency: 17 inch : 68 kHz / 85 Hz
19 inch : 91 kHz / 85 Hz
Screen: Back raster pattern
Bright: MAX
Contraster: MAX

1. Select **COLOR CHANNEL 3** to control the color for sRGB.
2. Adjust the luminance of the back raster to between 0.5 to 0.7 ft-L using the **G_CUT** controls.
3. Click on the << or >> boxes next to **R_CUT** and **B_CUT** to adjust the R-Bias to x = 0.312 ± 0.02 and the B-Bias to y = 0.329 ± 0.02.

4-3-5 (b) GAIN (WITHOUT ABL) ADJUSTMENT

1. Bright should be cut off.
2. Save after adjusting like this (Color coordinates x=0.313 ±0.015, y=0.329 ±0.015 Brightness 17 and 19 inch : 24 ± 1 F/L) with R, G, B gain key.

Notice : *The condition for adjusting is the same as 9300K.*
Don't adjust ABL to SRGB Mode
Modify with ABL.
Delete all the contents and add the contents below.

4-3-5 (c) WHITE BALANCE ADJUSTMENT

CONDITIONS

Scanning frequency: 68 kHz / 85 Hz
Display image: Full white pattern
Brightness: Cut-off
Contrast: Maximum

1. Click on the << or >> boxes next to **R_GAIN** and **B_GAIN** to make the video white. (For sRGB color adjustment: x = 0.312 ± 0.02, y = 0.329 ± 0.02.)
2. Select COLOR FACTORY SAVE to save the data.

Luminance Table 4-6.

	17"/19"
Without ABL	24 ft-L

4-3-6 Luminance Uniformity Check

Luminance is considered uniform only if the ratio of lowest to highest brightness areas on the screen is not less than 7.5:10.

CONDITIONS

Scanning frequency:
17 inch : 68 kHz / 85 Hz (1024 x 768)
19 inch : 91 kHz / 85 Hz (1280 x 1024)

Display image:	White flat field
Brightness:	Cut off point
Contrast:	Maximum

PROCEDURE

Measure luminance at nine points on the display screen (see figure below).

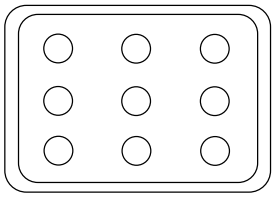

Figure 4-10 Luminance Uniformity Check Locations

4-3-7 Focus Adjustment

CONDITIONS

Scanning frequency:	17 inch : 68 kHz / 85 Hz 19 inch : 91 kHz / 85 Hz
Display image:	"H" character pattern
Brightness:	Cut off point
Contrast:	Maximum

PROCEDURE

1. Adjust the Focus VR on the FBT to display the sharpest image possible.
2. Use Locktite to seal the Focus VR in position.

4-3-8 Color Purity Adjustment

Color purity is the absence of undesired color. Conspicuous mislanding (unexpected color in a uniform field) within the display area shall not be visible at a distance of 50 cm from the CRT surface.

CONDITIONS

Orientation:	Monitor facing east
Scanning frequency:	17 inch : 68 kHz / 85 Hz 19 inch : 91 kHz / 85 Hz
Display image:	White flat field
Luminance:	Cut off point at the center of the display area

Note: *Color purity adjustments should only be attempted by qualified personnel.*

PROCEDURE

For trained and experienced service technicians only.

Use the following procedure to correct minor color purity problems:

1. Make sure the display is not affected by external magnetic fields.
2. Very carefully break the glue seal between the 2-pole purity convergence magnets (PCM), the band and the spacer.
3. Make sure the spacing between the PCM assembly and the CRT stem is 29 mm ± 1 mm.
4. Display a green pattern over the entire display area.
5. Adjust the purity magnet rings on the PCM assembly to display a pure green pattern. (Optimum setting: x = 0.295 ± 0.015, y = 0.594 ± 0.015)
6. Repeat steps 4 and 5 using a red pattern and then again, using a blue pattern.

Table 4-7. Color Purity Tolerances

(For 9300K color adjustment: x = 0.283 ± 0.02, y = 0.298 ± 0.02)

Red:	x = 0.620 ± 0.015	y = 0.334 ± 0.015
Green:	x = 0.289 ± 0.015	y = 0.595 ± 0.015
Blue:	x = 0.153 ± 0.015	y = 0.072 ± 0.015

7. When you have the PCMs properly adjusted, carefully glue them together to prevent their movement during shipping.

Memo